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Retraction

Retracted: The Optimal Integration of Computer Information Technology and Energy Economic Management

International Transactions on Electrical Energy Systems

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] N. Zhang and Z. Li, "The Optimal Integration of Computer Information Technology and Energy Economic Management," *International Transactions on Electrical Energy Systems*, vol. 2023, Article ID 9067413, 7 pages, 2022.

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Research Article

The Optimal Integration of Computer Information Technology and Energy Economic Management

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The author proposes a method combining entropy weight method and TOPSIS method with computer information technology in order to save energy with maximum efficiency and improve efficiency. The author constructs the optimal integration of computer information technology and enterprise economic management. Managers use computer information technology to analyze data and problems more accurately and have stronger control ability. The noncooperative game model of gender warfare game and smart pig game are used to simulate negotiation and cooperation in reality, which is conducive to the formulation of cooperation mechanisms and the flexibility of negotiation to promote the realization of regional energy cooperation. Finally, combined with computer information technology, a comprehensive evaluation model of the energy economic system is constructed by using the entropy weight method and the TOPSIS method. The authors used a paired t test for the three evaluation results to examine whether their evaluation results were significantly different. Experimental results show that the correlation coefficient between method 1, method 2, and method 3 are both 0.984, and the correlation coefficient between method 2 and method 3 is 0.974, and the results are all significant. *Conclusion*. The method can effectively improve the efficiency and effectiveness of energy economy, and the detection results are better.

1. Introduction

With the widespread use of computer information technology in the world, enterprises also make full use of computer information technology in energy economic management, which meets the requirements of the development of the times and keeps pace with the development of the times. In the information age, the use of computer information technology in the energy economic management of enterprises will have more prominent advantages, which will not only bring new opportunities to the enterprise itself but also achieve a leading position in the economic market. It can also bring a series of conveniences to enterprises, thereby providing economic benefits for enterprises. The use of computer information technology is a means and method for enterprises to carry out economic management. With the help of computer information technology, the effectiveness of economic management can be improved. The issue of energy has received increasing attention. Energy is the material basis for the survival and development of human society. Throughout the history of human social development, every major advancement in human social civilization has been accompanied by the improvement and replacement of energy. The development and utilization of energy has greatly promoted the development of the world economy and human society. In the next 20 years, the gap between energy supply and demand will continue to expand. The main reasons are uneven distribution of resources leads to increased difficulty in development; low energy efficiency leads to serious waste of resources; and unreasonable energy consumption structure leads to aggravation of environmental pollution, as shown in Figure 1 [1]. So far, the overemphasis on economic growth indicators and the sustainable production capacity of energy, and the neglect of economic growth mode and environmental pollution problems are still serious. The sustainable development mode of energy economy deserves further study [2]. Solving this problem in this big

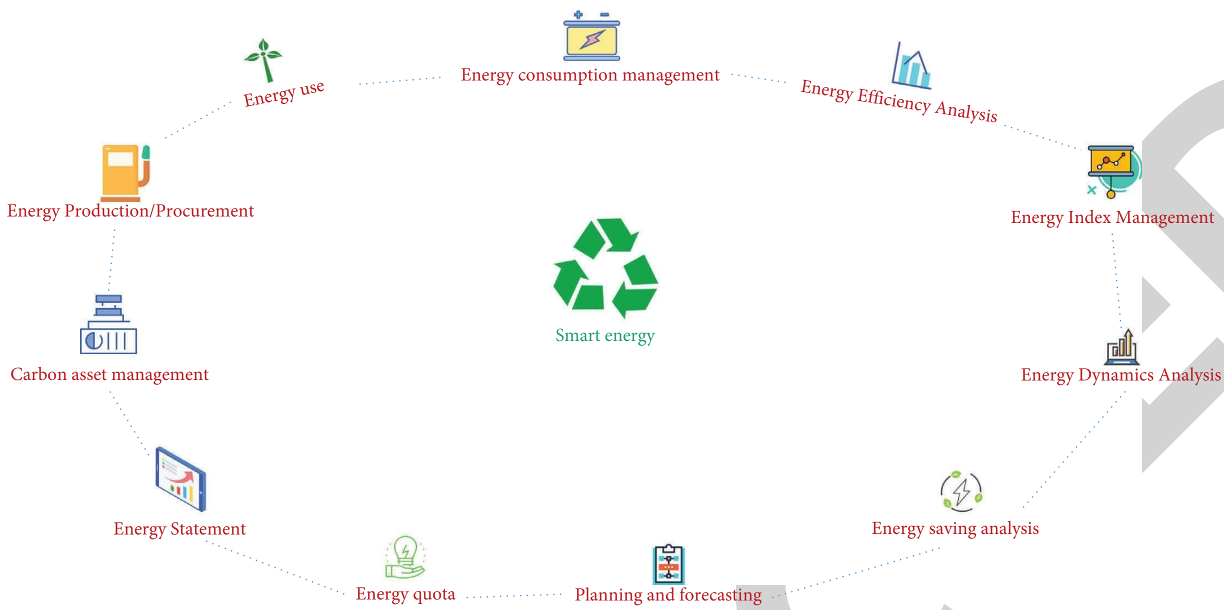

FIGURE 1: Energy economic management.

environment can save energy with maximum efficiency. Energy saving is a long-term strategic policy for my country's economic development. On the basis of ensuring energy supply, enterprise energy work, through intensive planning and taking safety measures to obtain the maximum reduction of production costs, in order to better serve the business goals of the enterprise. It should be said that it is the purpose of enterprise energy work, which plays an important role in the sustainable and healthy development of the economy and the improvement of people's living standards. Research on energy economy is of great significance to the development of human society [3].

2. Literature Review

Karimi used a historical deductive approach to propose an explicit energy economic growth model, drawing the conclusion that the current socioeconomic model is unsustainable and energy security critical [4]. Ldn used sample data from a certain region, the causal relationship between GDP and total energy consumption and consumption of various energy sources (coal, oil, natural gas, and electricity) was analyzed separately by using cointegration techniques. It is found that there is no cointegration relationship between GDP and these, but there is a two-way Granger causality relationship with total energy consumption, coal, and electricity, respectively. There is a one-way Granger causality from GDP to oil and natural gas to GDP [5]. Zhou examined the relationship between per capita energy consumption and per capita GDP in 11 oil-exporting countries using panel unit root and cointegration techniques. The results show that there is a one-way Granger causality between economic growth and energy consumption [6]. Carrasco et al. introduced energy variables into the C-D production function. The results from the research on the relationship between economic growth and energy consumption show that economic development is inseparable from energy [7]. The results of the empirical study by Han et al. show that, in the short term, there is a fluctuating relationship between energy consumption and GDP, but in the long run, there is a stable equilibrium relationship between energy consumption and economic growth, and there is a one-way causal relationship from energy consumption to economic growth [8]. Guo et al. showed that through the cointegration analysis of energy consumption and economic growth, there is a long-term equilibrium relationship between them, and the past economic growth mainly relied on energy consumption [9]. A study of an economy by Hyland et al. shows that: The ecological index of economic growth is between the "national standard value" and the "warning value," and the health of the economic growth pattern during this period is relatively poor [10]. Through the research of Granger causality test, cointegration test, and error correction model, Jayakumar et al. show that there is a significant one-way Granger causality between economic growth and energy consumption, and there is a long-term equilibrium relationship between the two [11]. In view of the above problems, the author proposes a method to construct a comprehensive evaluation model for the energy economic system using the entropy weight method which is the TOPSIS method and the combination of the two methods in combination with computer technology. The sustainable development capacity shows an increasing trend, while the coordination capacity first increases and then weakens, specifically, it gradually shifts from moderate sustainable development capability and coordination capability to moderate sustainable development capability and strong coordination capability, and transitions to a state where both sustainable development capability and coordination capability are strong. In order to take into account the improvement of system coordination; make overall planning for the coordinated development of energy, economy, population, and environment, and then continuously promote the sustainable development of energy economy.

3. Methods

3.1. Optimal Integration of Computer Information Technology and Enterprise Economic Management. Computer information technology brings advanced ideas and methods to enterprise economic management. In the economic management of enterprises, it is necessary to have advanced ideas and management methods in order to be one step ahead of other enterprises in the market. Therefore, it is necessary to use computer information technology. Management software in computer information technology is the carrier of management ideas and management models. For example, customer management software can provide enterprises with scientific product and service evaluation methods; human resource management software can bring a convenient performance appraisal system to the enterprise; and financial management software makes the analysis methods of management accounting convenient to apply. This management software brings advanced ideas and methods to enterprise economic management [12]. Computer information technology promotes the establishment of modern management methods in enterprise economic management. Traditional economic management methods have been unable to promote the development of enterprises, and we must actively use computer information technology to promote enterprises to gradually move towards the era of e-commerce [13]. For example, various application software in e-commerce solutions help enterprises to carry out online transactions such as online ordering, distribution, and settlement; there are also ERP software based on supply chain, which can realize the business interaction between enterprises, suppliers, and customers. Use computer information technology to improve the effectiveness of economic management. Traditional economic management methods make many management functions stay in time and delay development, and real-time control in the event and precontroller in advance appear to be more difficult. When the enterprise is carrying out economic management, the implementation of manufacturing management software can eliminate the lack of planned production and achieve zero inventory. The use of ERP software in economic management can effectively arrange and dispatch funds, reduce unnecessary cash reserves, and reduce financial expenses. The system software can make various management reports available at any time. Computer information technology helps enterprise economic managers to break through the limitations of their ability. At present, the use of computer information technology in enterprise economic management can help managers implement various management requirements, achieve management goals that could not be achieved in the past, and expand management space. Managers can use financial software to have more precise financial control capabilities: Using data warehouses, managers will have stronger data memory capabilities [14]. Therefore, managers use computer information technology to analyze data and problems more accurately and have stronger control ability.

3.2. Analysis of Abnormal Energy Consumption Data. The energy management system needs to collect and store a large amount of energy consumption data of the supervised objects, classify the data according to the energy consumption objects such as buildings, departments, and pipelines, and display it to the system users. Faced with such a large amount of data, it is difficult for us to effectively find unreasonable energy consumption or abnormal energy consumption in the energy consumption system, and it is almost impossible to find various problems in the system at the equipment, design, or operation level. Through computer information processing technology, the establishment of an energy consumption data model provides us with a higher tool for energy consumption analysis and diagnosis. Modern building energy efficiency systems help system users deal with these massive data through two tools: alarm and warning mechanisms and data presentation software [15]. Today, in most building energy-saving systems, the normal operation of the abnormal energy consumption alarm function completely depends on the user selecting the corresponding limit or threshold value for the energy consumption alarm and warning through the man-machine interface. This is a very difficult task for the user: If the threshold is set too tight, there will be a lot of false positives in the system; if the threshold is set too loosely, the system will not be able to discover all the abnormal energy usage and the damage to the system and equipment behind it. Data presentation software can help users analyze and diagnose problems, but such untargeted operations often take a lot of time.

3.2.1. Data Mining. The energy management system takes energy informatization and intelligence as the core goal and is fully developed around the intelligence of energy information collection, information processing, information display and push, and energy regulation and control [16]. Intelligent information collection is the key technology of campus energy management system, the intelligent information collection equipment in the system needs to have the characteristics of self-organizing network, self-diagnosis, self-repair, uninterrupted operation, high stability, and high reliability and can automatically collect energy information in the campus, reduce the human input in information collection, and improve the accuracy and reliability of collection. The intelligent information processing can analyze and process the information by the system central server or rely on the powerful processing capability of cloud computing, and provide a strong data guarantee for decision-making [17].

3.2.2. Economic Subsystem. The economic subsystem belongs to the power subsystem. In the system, future economic growth is determined by the economic growth rate and the economic aggregate in the base period, and affects energy consumption through three industries, it affects the total population through per capita GDP and, at the same time, excessive economic growth will have adverse effects on the environment [18]. The flow of the economic subsystem is shown in Figure 2.

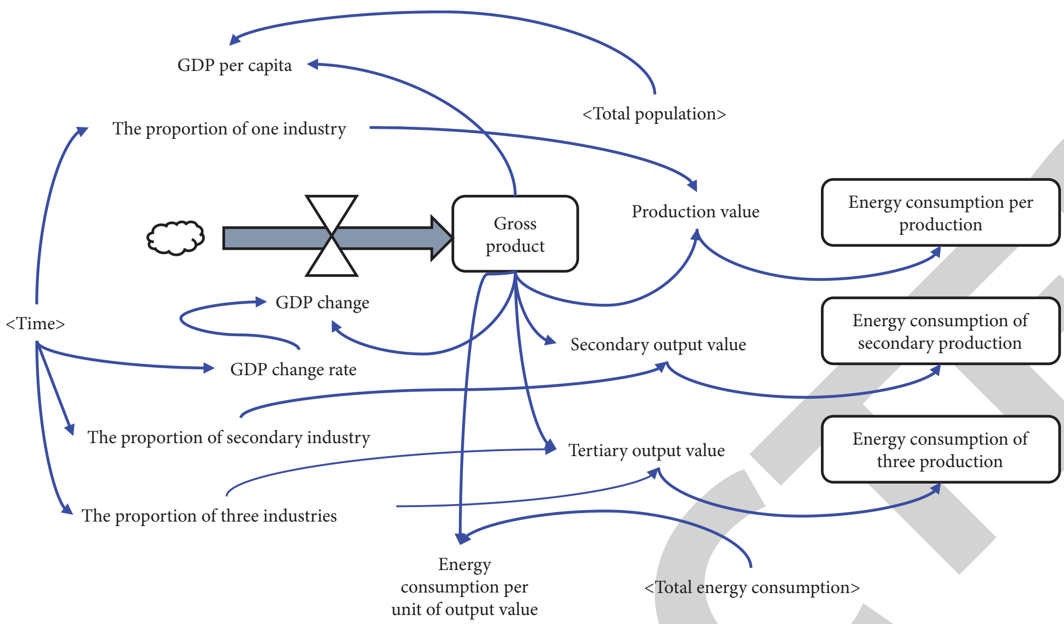

Figure 2: Flow chart of the economic subsystem.

3.3. Comprehensive Evaluation Model Based on the Entropy Weight Method. At present, there are many methods for evaluating sustainable development index systems at home and abroad, such as the principal component analysis method, the grey relational analysis method, and attribute reduction method of rough set. The established models include the fuzzy comprehensive evaluation model, the multidimensional grey evaluation model, and the regression analysis joint integration model [19]. The methods for determining the weights of evaluation indicators can be divided into two types: objective assignment and subjective assignment. Among them, the subjective evaluation methods mainly include AHP, Delphi, and other methods. Most of these methods are qualitative analysis and are greatly affected by human factors, so the evaluation results are likely to be distorted; The objective assignment method mainly includes factor analysis method, principal component analysis method, entropy value method, and other methods. These methods determine the weight by the degree of difference and mutual relationship between the index data, therefore, errors caused by subjective factors are avoided. The author uses information entropy to determine the weight of the sustainable evaluation index of the energy economy.

3.3.1. Principle of Entropy Weight Method. Entropy was originally a thermodynamic concept, and now it has been widely used in engineering technology, social economy, and other fields. The entropy weight method is an objective evaluation method based on the principle of entropy, which can effectively avoid the deviation caused by human factors [20]. The information entropy describes the relative magnitude of the change of the index value through the rate of change of the sample data and thus obtains the weight of the index. The faster the index value changes relative to the ideal value, the smaller its information entropy will be, and on the contrary, the greater the utility, the greater the weight. Therefore, the weight determined by the entropy method represents the relative rate of change of the indicator, and the relative level of the indicator is represented by the degree of progress after normalization of the sample data. The final evaluation value is their product, which well reflects the combination of the development speed and relative speed of the index. To sum up, the entropy method avoids the influence of human factors on the weight of indicators, making the selection of weights more scientific. Assuming that there are m evaluation indicators and n evaluation samples in the evaluation index system, the set of all sample indicators is: $S = \{s_1, s_2, \ldots, s_n\}$, each subsample can be described as: $s_i = \{C_{i1}, C_{i2}, \ldots, C_{im}\}$. The initial data matrix C of the indicator is: $C = \{c_{ij}\}_{n\times m}$, $i = 1, 2, \ldots, n$; $j = 1, 2, \ldots, m$, among them, c_{ij} is the value of the jth evaluation index in the ith year. Since, the numerical dimensions of the evaluation indicators may be different and cannot be compared with each other, the author first standardized the initial data matrix C. The indicators are divided into reverse polarity, positive polarity, and moderate polarity. If the ideal value of the index C_j is C_{ij}^*, the smaller the C_{ij}^* of the reverse polarity index is, the better, the greater the positive polarity index, the better, and the moderate polarity index is the best. Assuming $M_j = \max\{c_j\}$ and $m_j = \min\{c_{ij}\}$, the ideal value of the reverse indicator is $C_{ij}^* = m_j/c_{ij}$, and the ideal value of the positive indicator is $C_{ij}^* = c_{ij}/M_j$. Note that the normalized value of C_{ij}^* is y_{ij}, as shown in the following formula:

$$y_{ij} = \frac{C_{ij}^*}{\sum_{i=1}^{n} C_{ij}^*}, \quad y_{ij} \in (0, 1). \tag{1}$$

Therefore, the initial data matrix C of the indicator can be expressed as the following formula after normalization.

Table 1: Degree grading on the interval [0, 1].

B_1	System Sustainability Status
$B_1 \in [0, 0.3)$	Very poor
$B_1 \in [0.3, 0.5)$	Poor
$B_1 \in [0.5, 0.7)$	Moderate
$B_1 \in [0.7, 0.9)$	Strong
$B_1 \in [0.9, 1)$	Very strong

$$Y = \left\{ y_{ij} \right\}_{n\times m}. \quad (2)$$

Due to the normalization of the initial data, the evaluation value of sustainability is between 0 and 1. The closer the calculated index evaluation value is to 1, the greater the influence of the index on the system sustainable development capability of the sample; and vice versa. The author classifies the sustainable development capability according to the classification standard of correlation degree in statistics, as shown in Table 1.

The index of system coordination ability is mainly used to examine the coordination status among the four subsystems of energy, the economy, the environment, and population. Their coordination relationship shows that the values of their respective development levels should be balanced. That is, the more coordinated the relationship between them is, the closer the values of their respective development levels are; otherwise, the deviation of the development level value will be larger.

3.4. Principle of TOPSIS Method

3.4.1. TOPSIS Method. The technique for order preference by similarity to ideal solution, referred to as TOPSIS) is a sorting method that approximates the ideal solution. It is one of the methods to establish a preference relationship with positive and negative ideal solutions as a reference, and to deal with the sorting and selection of multiobjective decision-making problems. The basic idea is the virtual optimal solution (also called the positive ideal solution, that is, the optimal value of each indicator) and the worst solution (also called negative ideal solution; that is, the worst value of each indicator). The relative closeness of the solution to the solution in the target space. In order to measure the degree to which a solution is close to the positive ideal solution and far away from the negative ideal solution, use the value of relative closeness (0–1) to determine the order of the schemes. The greater the relative closeness, the better the scheme, and vice versa. The research steps of the TOPSIS method are shown in Figure 3. As can be seen from Figure 3, the steps of the TOPSIS method research: first, in order to eliminate the influence of different measurement units, it is necessary to normalize the indicators; second, multiple alternatives are found by normalizing the processed raw data matrix.

The TOPSIS method is a comprehensive distance evaluation method for multiattribute decision-making schemes. Its advantages are that by normalizing the original data, eliminates the influence of different dimensions, uses the original data information to sort the results, and quantitatively reflects the pros and cons of different evaluation schemes. Moreover, there are no strict requirements on sample size, data distribution, and the number of indicators. Different indicators can be combined for comprehensive evaluation. It has the characteristics of small calculation amount, intuitive geometric meaning, wide application range, and small information distortion. The comprehensive evaluation index system of sustainable development of the energy economy is a complex system with 39 indicators. The TOPSIS method can directly, clearly, and accurately reflect the state of sustainable development of the energy economy.

3.4.2. Smart Pig Game Model. The smart pig game is a proposed noncooperative game model. Suppose there is a big pig and a small pig in the pig sty. The two parts of the pig sty have a pig trough and a button, respectively. The button is used to control the supply of pig food. Pressing the button will bring 10 units of pig food into the trough, but whoever presses the button will need to pay the cost of 2 units. If the big pig arrives first, it will eat 9 units of pig food, while the little pig can only eat 1 unit. When both arrive at the same time, the big pig will eat 7 units and the little pig will eat 3 units. If the little pig comes first, the big pig will eat 6 units and the little pig will eat 4 units. By calculating the cost and benefit, the payment matrix of the big pig and the little pig can be obtained as shown in Table 2.

It can be seen that in the smart pig game, whether the big pig chooses to act or wait, the best choice for the little pig is to wait. Given the choice of strategy that the little pig is waiting for, the optimal choice for the big pig can only be action. Therefore, the Nash equilibrium of this game is that the big pig moves and the little pig waits, and each gets 4 units of net profit. The enlightenment of the game of smart pigs is that more work does not necessarily mean more, and less work does not necessarily mean less, which confirms the free-rider behavior in public goods cooperation. The significance of the smart pig game for regional energy cooperation is that in the process of energy cooperation, some countries will take the free-rider strategy choice without paying the corresponding cost, which is not conducive to the development of regional energy cooperation; therefore, strengthening the negotiation and implementing the principle of differentiated treatment will contribute to the realization of regional energy cooperation.

3.4.3. Gender War Game Model. Gender warfare game is a cooperative game model. Suppose a couple has only one TV at home. The husband likes to watch football games and the wife likes to watch soap operas. If both parties agree to watch football games, then the husband gets 2 units of utility and the wife gets 1 unit of effect; if both parties agree to watch soap operas, the wife gets 2 units of effect and the husband gets 1 unit of the effect; if the two sides disagree, the result can only be ignored by everyone, and each can only get 0 units of utility. The payment proofs of both parties are shown in Table 3.

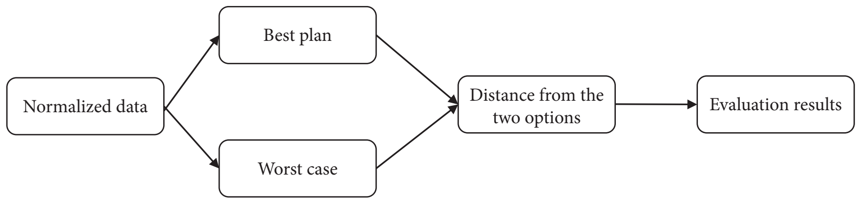

Figure 3: The steps of the TOPSIS study.

Table 2: Smart pig game matrix.

		Piggy	
		Action	Wait
Big pig	Action	5; 1	4; 4
	Wait	9; −1	0; 0

Table 3: Gender war game matrix.

		Wife	
		Football game	Soap opera
Husband	Football game	2; 1	0; 0
	Soap opera	0; 0	1; 2

It can be seen that there are two equilibrium outcomes in the gender war game, both sides of the game will prefer an equilibrium, for example, the husband prefers football games, while the wife prefers soap operas. However, an equilibrium result will still occur, because both parties will gain more profit if they reach an agreement than if they disagree. The emergence of an equilibrium outcome will depend on the importance of the position of both parties in the family, the skills of negotiation, and the choice of taking turns calling the shots. The significance of the gender war game for regional energy cooperation lies in the flexibility of cooperation mechanism formulation and negotiation. There is also the dilemma of joint risk avoidance in regional energy cooperation, which leads to the breakdown of cooperation, however, noncooperation is not beneficial to both parties, which makes the emergence of equilibrium results possible. The emergence of the two equilibrium results means that the strength of both parties, the negotiation process and the availability of information in regional energy cooperation will determine the direction of the equilibrium results, formulating agreements, and establishing compensation mechanisms, will make cooperation more stable, so as to facilitate the realization of regional energy cooperation.

4. Results and Discussion

We refer to the entropy weight method as method 1, the TOPSIS method as method 2, and the entropy weight TOPSIS method as method 3. The results of the three evaluation methods for the development level of energy economy are basically the same, and the only difference is the magnitude of the value, which is due to the difference in data processing methods. To further investigate their differences, the authors used a paired t test on the three evaluation results to examine whether their evaluation

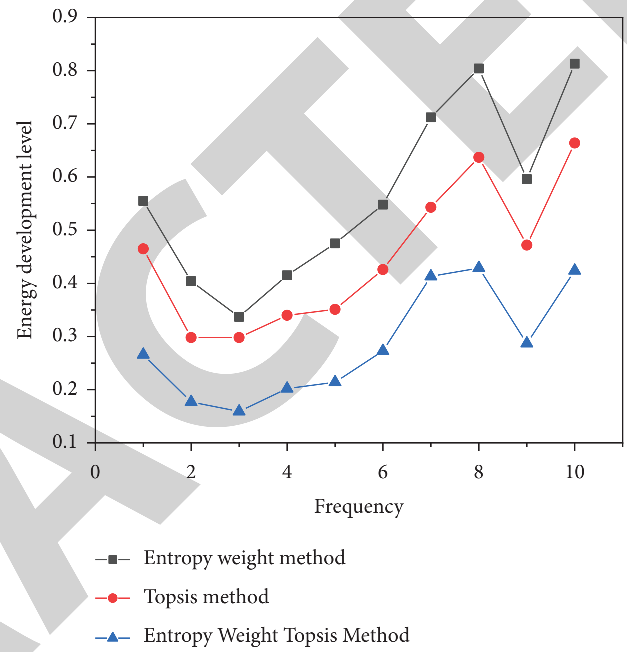

Figure 4: Comparison of energy development level results.

results were significantly different, and the results showed the correlation coefficients between method 1, method 2, and method 3 are both 0.984, and the correlation coefficient between method 2 and method 3 is 0.974, and the results are all significant. Since the correlation coefficient is between [0, 1], the larger the value, the more consistent the results of the two methods are, as shown in Figure 4. Therefore, the evaluation results of the three methods on the energy development level are basically the same.

The ability of sustainable development shows an increasing trend, while the ability of coordination first increases and then decreases. Specifically speaking, firstly, sustainable development capacity and coordination capacity are relatively moderate. Then, gradually turn to sustainable development ability moderate and strong coordination ability. Finally, it has transitioned to a state of strong sustainable development capacity and coordination.

5. Conclusion

The author analyzes the composition of the comprehensive evaluation index system for the sustainable development of the energy economy and uses the entropy weight method, the TOPSIS method and the combination of the two methods in combination with computer technology to construct a comprehensive evaluation model for the energy economic system. The noncooperative game model of gender warfare game and smart pig game is used to simulate negotiation and cooperation in reality, which is conducive to the formulation of cooperation mechanism and the flexibility of negotiation to promote the realization of regional energy cooperation. Then combined with the computer information technology, the entropy weight method and the TOPSIS method are combined to build a comprehensive evaluation model for the energy economic system. After analysis, it is known that the means of perception and wisdom should be used to save energy and reduce emissions, give priority to energy conservation, improve energy utilization efficiency, and improve the sustainable development capability of the energy economic system, while taking into account the improvement of system coordination capabilities. Coordinate and plan the coordinated development of energy, economy, population, and environment, and then continuously promote the sustainable development of China's energy economy.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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